

IN THE CLAIMS:

The text of all pending claims, (including withdrawn claims) is set forth below. Cancelled and not entered claims are indicated with claim number and status only. The claims as listed below show added text with underlining and deleted text with ~~strikethrough~~. The status of each claim is indicated with one of (original), (currently amended), (cancelled), (withdrawn), (new), (previously presented), or (not entered).

1. (Currently amended) An object handling apparatus for handling an object to transfer the object from a first place to a second place with a predetermined position/orientation, said apparatus comprising:

a robot having a robot hand for holding the object;

a movable device movable independently of the robot;

~~detecting means, associated with~~provided at the movable device, for detecting a position/orientation of the object held by the robot hand relative to the robot hand; and compensating means for compensating for the position/orientation of the robot hand for transferring the object to the second place based on the position/orientation of the object relative to the robot hand detected by said detecting means.

2. (original) An object handling apparatus according to claim 1, wherein the object is transferred to a jig of a machine tool at the second place.

3. (original) An object handling apparatus according to claim 1, wherein said robot hand has fingers driven by one or more servomotors.

4. (original) An object handling apparatus according to claim 3, wherein said robot hand holds the object by positioning of the fingers by the one or more servomotors in accordance with a shape of the object.

5. (Currently amended) An object handling apparatus according to claim 3, wherein command torques to the one or more servomotors for driving the fingers of said robot hand are altered ~~in accordance with characteristics of the object, the characteristics selected from the group consisting of:~~

~~a type of material of the object,~~

~~a shape of the object, and
a weight of the object.~~

6. (original) An object handling apparatus according to claim 3, wherein said one or more servomotors for driving the fingers of said robot hand are controlled by a controller of said robot.

7. (Currently amended) An object handling apparatus for handling an object to transfer the object from a first place to a second place with predetermined position/orientation, said apparatus comprising:

a robot having a robot hand for holding the object;

first detecting means for detecting a position of the object supplied to the first place;

control means for moving the robot hand to a holding position for holding the object using the detected position of the object detected by said first detecting means and for controlling the robot hand to hold the object at the holding position;

a movable device movable independently of the robot;

second detecting means, associated with provided at the movable device, for detecting a position/orientation of the object held by the robot hand relative to the robot hand;

moving means for moving said robot hand or said second detecting means such that said robot hand holding the object has a predetermined detecting position/orientation relative to said second detecting means; and

compensating means for automatically compensating for the position/orientation of the robot hand predetermined for transferring the object to the second place based on the position/orientation of the object held by the robot hand relative to the robot hand detected by said second detecting means.

8. (original) An object handling apparatus according to claim 7, wherein said first detecting means comprises a two-dimensional visual sensor.

9. (original) An object handling apparatus according to claim 7, wherein said first detecting means comprises a three-dimensional visual sensor.

10. (original) An object handling apparatus according to claim 7, wherein said second detecting means comprises a two-dimensional visual sensor.

11. (original) An object handling apparatus according to claim 7, wherein said second detecting means comprises a three-dimensional visual sensor.

12. (original) An object handling apparatus according to claim 7, wherein said first detecting means functions as said second detecting means.

13. (Previously presented) An object handling apparatus for handling an object to transfer the object from a first place to a second place with a predetermined position/orientation, said apparatus comprising:

a robot having a robot hand for holding the object;

first detecting means for detecting a position of the object supplied to the first place;

control means for moving the robot hand to a holding position for holding the object using the detected position of the object detected by said first detecting means and for controlling the robot hand to hold the object at the holding position;

second detecting means for detecting a position/orientation of the object held by the robot hand relative to the robot hand;

moving means for moving said robot hand or said second detecting means such that said robot hand holding the object has a predetermined detecting position/orientation relative to said second detecting means; and

compensating means for automatically compensating for the position/orientation of the robot hand predetermined for transferring the object to the second place based on the position/orientation of the object held by the robot hand relative to the robot hand detected by said second detecting means, and

wherein said moving means comprises an additional robot to which said second detecting means is attached.

14. (original) An object handling apparatus according to claim 7, wherein the object is transferred to a jig of a machine tool at the second place.

15. (original) An object handling apparatus according to claim 7, wherein said robot hand has fingers driven by one or more servomotors.

16. (original) An object handling apparatus according to claim 15, wherein said robot hand holds the object by positioning of the fingers by the one or more servomotors in accordance with a shape of the object.

17. (Currently amended) An object handling apparatus according to claim 15, wherein command torques to the one or more servomotors for driving the fingers of said robot hand are altered ~~in accordance with characteristics of the object, the characteristics selected from the group consisting of:~~

~~a type of material of the object,~~
~~a shape of the object, and~~
~~a weight of the object.~~

18. (original) An object handling apparatus according to claim 15, wherein said one or more servomotors for driving the fingers of said robot hand are controlled by a controller of said robot.

19. (Currently amended) A robotic handling system, comprising:
a first robot having a hand which moves an object from a first position to a second position;

a first sensor which senses a first position and/or orientation of the object at the first position;
a movable device movable independently of the first robot; having
a movable second sensor ~~associated with~~ provided at the movable device, which senses a second position and/or orientation of the object at the second position and

a controller which adjusts the hand to compensate for a difference between the first position and/or orientation of the object and the second position and/or orientation of the object such that the object is at the second position at the second desired position and/or orientation.

20. (Currently amended) A robotic handling system, comprising:
a first robot having a hand which grabs an object, the first robot moves the object from a first position to a second position;
a first sensor which senses a first position and/or orientation of the object at the first position;

a movable second sensor associated with a movement mechanism which senses a second position and/or orientation of the object at the second position, wherein the movable second sensor is moved by a second robot; and

a controller which adjusts the hand at the first position such that the hand grabs the object in a first desired position and/or orientation, the controller adjusts the first robot and the hand at the second position such that the object is at the second position at a second desired position and/or orientation.

21. (Currently amended) An object handling apparatus for handling an object to transfer the object from a first place to a second place with a predetermined position/orientation, said apparatus comprising:

a first robot having a robot hand for holding the object;

a second robot;

a first position detector detecting a position of the object ~~associated with~~ at the first place;

said second robot having a second position detector associated with ~~provided at~~ the second robot and detecting the position of the object relative to the robot hand; and

a compensator compensating for a position of the robot hand for transferring the object to the second place based on the position of the object relative to the robot hand detected by said second position detector.

22. (Currently amended) A method of transferring an object from a first place to a second place, comprising:

detecting a position of the object ~~associated with~~ at the first place with a first position detector;

detecting the position of the object held by the robot hand relative to the robot hand with a second position detector ~~associated with a second robot~~; and

compensating for the position of the object relative to the robot hand and transferring the object to the second place.

23. (Cancelled)